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L'étude aborde d'un point de vue prospectif la question de l'amélioration de l'enseignement universitaire. L'évolution de la société actuelle semble générer deux voies d'approche du futur antagonistes dont les pôles seraient le modèle béhavioral - qui définit l'homme par son comportement - et le modèle phénoménologique - qui définit l'homme par sa conscience. Le document tente d'esquisser un type de planification qui puisse combiner ces deux approches afin d'élaborer des programmes d'enseignement qui soient adéquats aux besoins futurs de l'étudiant.

Soulignant les limites du processus de planification actuel qui réduit l'homme à ses dimensions économique et rationnelle, le document souligne l'importance d'une planification flexible, axée sur le long terme, qui tienne compte de l'ensemble des besoins de l'homme dans la formulation de ses objectifs. Un examen de la situation sociale actuelle et des "contextes futuribles" est ensuite esquissée. L'exposé des avantages de la méthode du scénario multiple (technique de simulation) dans l'élaboration d'une planification dynamique comportant des boucles de rétroaction termine l'étude.

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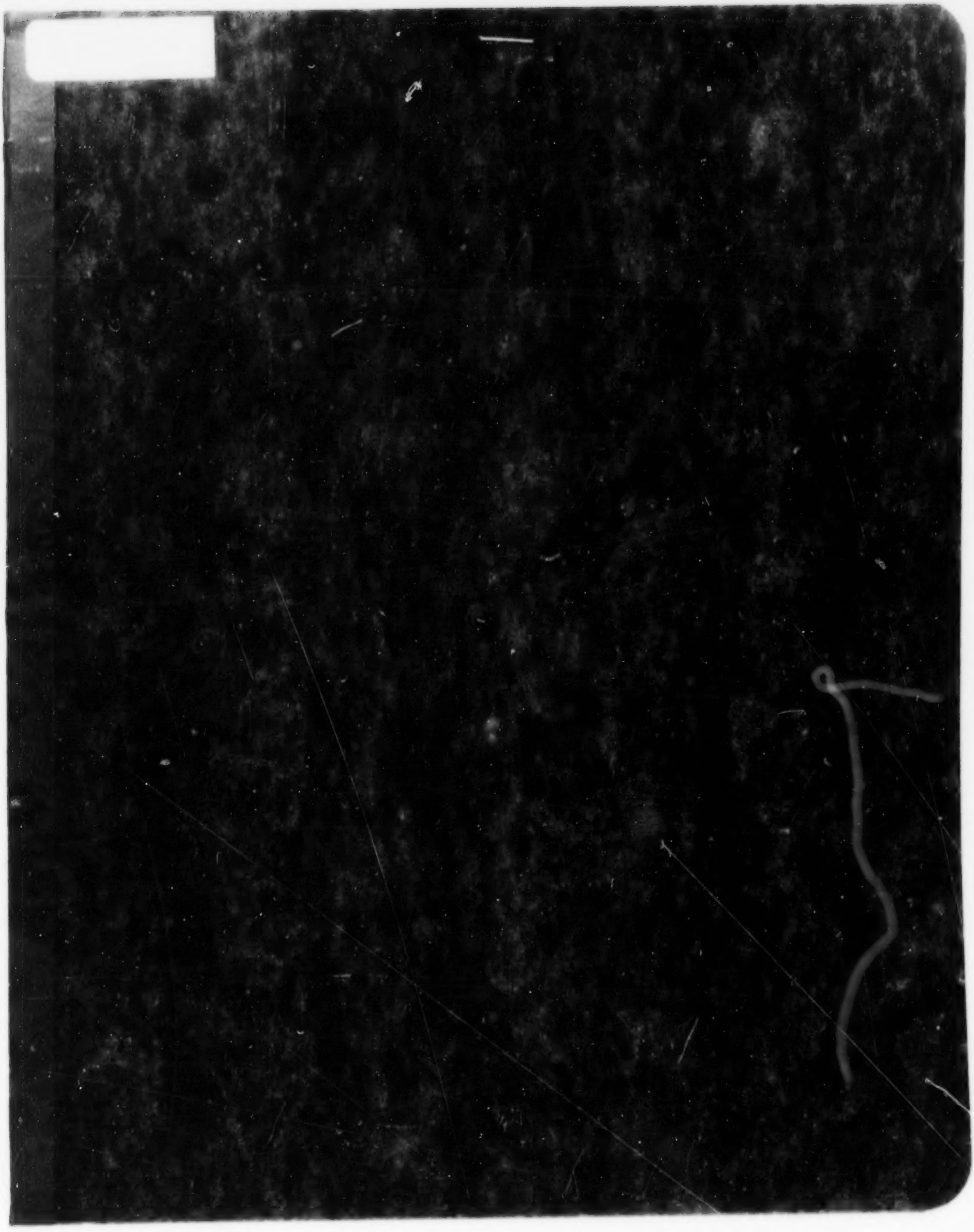

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LA CONFÉRENCE DES RECTEURS ET DES PRINCIPAUX
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PROSPECTIVE IN HIGHER EDUCATION

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INTRODUCTION

Central to the fundamental changes that are currently occurring in higher education is the observation that: "The natural tendency to think of only one thing at a time is the chief reason why we have failed to understand the environment and have blundered into destroying it" (Barry Commoner: The Closing Circle: Nature, Man and Technology, p. 26). A further observation develops the idea of a dichotomy in the future goals for the evolution of society. The polarities of this dichotomy are described in Hitt's two models of man:

> "The behavioristic model: Man can be described meaningfully in terms of his behavior; he is predictable; he is an information transmitter; he lives in an objective world; he is rational; he has traits in common with other men; he may be described in absolute terms; his characteristics can be studied independently of one another; he is a reality; he is knowable in scientific terms.
>
> "The phenomenological model: Man can be described meaningfully in terms of his consciousness; he is unpredictable; he is an information generator; he lives in a subjective world; he is arational; he is unique alongside millions of other unique personalities; he can be described in relative terms; he must be studied in a holistic manner; he is more than we can even know about him". (W.D. Hitt, "Two Models of Man". American Psychologist, July 1969).

This dichotomy is developed in W.W. Harman's analysis of future social trends leading to either a "Second Phase" Industrial Society or a "Person Centered" Society....

If these observations are assumed to be valid, and there is no reason why they should not, and planning is understood to be a dynamic process which attempts to effect a continuous compromise between polar images of society (Pusic calls it the resolution of conflicts between interest groups in Society) then the problem for higher education at a very general level is how to produce individuals who are both aware of the polarities and able to design and select courses of action which guide them, and society, between the polarities. This implies that the universities can no longer be passive producers of technicians. They have a responsibility to society at large, not simply to the national economy and purely academic interest. Students must accordingly be trained to make choices, to establish their own value-sets from a rational stand-point.

Thus, in this project, we are attempting to deal with the nature of the product of the universities as a fundamental objective of the planning process. In order to do this,

we cannot confine ourselves to an analysis and projection of the means and process of production. We have to attempt to understand the context in the present and also forecast as many possible alternative contexts as we can (although forecasting is not really an objective of this project). For this purpose we need tools and techniques, and we propose to examine available tools and techniques and their usage along the lines of long-range simulation models of development - stressing a comparison between non-time -varying and time-varying types. Special emphasis must be given to those models explicitly utilizing a feed-back loop structure and multiple variables.

In this way, we hope to suggest a means of developing a strategy for higher education through the utilization of long-range simulation, and to suggest its implementation through the selection of tactical or short-term goals and their achievement with the help of optimization techniques, thus creating a synthesis which is significantly lacking in modern planning, as observed in the first quotation in this introduction.

This type of planning, it is emphasized, does not envisage the establishment of specific long-term quantitative

goals and their attempted attainment - a policy roundly criticized in G. Williams article in the special issue of Higher Education - but it is an attempt to encourage the simulation of socio-economic trends in Quebec governed by a wide range of variables, to test these trends against the implementation of various policies (a good idea might be to compare the results of simulation runs with the results of Delphi forecasts) and to identify indicators which signal the probable occurence of events in the future. This would then allow a response to these indicators, as they appear in the real world, through the establishment of short-term goals - such as changes in responsiveness by institutions, or changes in curriculum design - and their attainment. It is suggested that this approach would give maximum flexibility within a rational structure, relying as it would on constant feed-back from the social and political environments.

PART ONE - PLANNING DEFINITIONS

DEFINITION

The long term policy objective of institutions of higher education in the Province of Quebec is to provide relevant higher education. Planning in higher education is herein defined as the rationalization of the means by which that objective is reached.

Relevance is the vital criterion in this case and, in spite of our protestations to the contrary, is historically determined by the interest group in our society that holds the balance of power. This is political reality, in the face of which our definition of planning in higher education takes on connotations of mounting complexity. It is these connotations, and in particular this complexity which are forcing themselves into our attention in spite of all our efforts to avoid a confrontation. The crisis which we see and sometimes only sense about us is, we would argue, a crisis of cognition, in which we are presented with an array of problems of an order such that, to enable us to find solutions, it requires us to subject our present technology of planning and administration, and the assumptions and values underlying it, to a severe scrutiny. The discomfort of our crisis is augmented by the suspicion, rapidly becoming

knowledge, that the latter will not stand up to the necessary severity of our scrutiny. We are at a stage in Dewey and Piaget's cognitive-developmental metaphor where "a core of universal ideas are redefined and reorganized as their implications are played out in experience and as they are confronted by their opposites in argument and discourse. These reorganizations define qualitative levels of thought, levels of increased epistemic adequacy". (1)

It is submitted that the unacknowledged realization that the balance of power in higher education is currently swinging from the vendors (government and educators) to the consumers (students and public) requires just such a reorganization of core ideas and concepts, and that in order to plan successfully to provide relevant higher education, we must develop a view of planning which fits social, political and economic reality. Problems of a higher order of complexity than we are used to dealing with require us to develop a higher order of intellectual ability in order to find solutions for them. As in any systemic development, this higher order comes about as a result of re-organization rather than enforced growth. Enforced growth is simply a panic reaction and avoidance of the real issues - a rear-guard action by an interest group which senses that power is slipping

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(1) L. Kohlberg and R. Mayer: "Development as the Aim of Education", Harvard Educational Review, vol. 42, November 1972, p.456.

from its hands: it does not bring about "increased epistemic adequacy".

THE BACKGROUND

The assumptions underlying the still prevalent view of educational planning grew out of the years immediately following world war II.

> "The prevailing assumptions of the time seemed to be that economic growth is a necessary condition for the advancement of human welfare and that the more growth any country can attain the better off its people will be. Moreover it seemed justified to believe that a re-allocation of a country's investment leading to more education would eventually yield a return on investment from greater increases in G.N.P. As a part of these same assumptions, it seemed warranted to believe that with an expansion of participation in education there would follow a democratization in the distribution of educational opportunities and eventually a more equitable distribution of income. Finally, it seemed justified to believe that increased expenditures for education would be accompanied also by rising levels of academic achievements". (1)

These assumptions give rise to a concept of planning based on the following observations and analysis:

> At the practical planning level three main positions have been adopted arising out of the empirical observations that rich countries usually have more educated people than poor countries, and that on average educated people earn more

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(1) T.F. Green: "The shifting Context for Educational planning"; in T. Green, Ed., Educational Planning in Perspective: Forecasting and Policy Making: I.P.C. Business Press Limited, Guildford, England, 1971, p.6.

> than uneducated people. The first interpretation of this evidence was that education causes the higher incomes by increasing general productivity which is reflected in higher earnings. planning implications are that where earnings associated with a particular qualification are particularly high in relation to the costs of providing that qualification, its provision should be expanded. The second view is that different types of education provide people with specific skills required by a modern economy, and planning consists of forecasting the rate of growth of requirements of these separate skills and gearing the educational system to supplying them. The third possibility is that education is a consumption good on which countries prefer to spend a higher proportion of their incomes as they get richer. The higher income of educated individuals is not because they are more socially productive but is the result of a purely distributive effect in favour of the educated. They are preferred by employers for a variety of social, cultural and psychological reasons. Planning in this case consists of predicting the demand for education by individuals and deciding on general political grounds - usually those of equity - how it should be subsidized". (1)

It is thus that "Educational planning tended to be viewed as a technical enterprise conducted by experts, separated from the actual process of policy formation but which provided information, data and analyses for those politicians and decision-makers who would actually participate in setting policy. Planning for education was typically believed to be appropriately centralized in some government agency, not only because of its professional and technical demands, but also because, to be effective, it must take into account national

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(1) G. Williams: "What Educational Planning is About". Higher Education, vol. 1, no. 4, November 1972, p.386.

goals and priorities as contrasted with merely local or regional aspirations". (1)

These assumptions and this concept of planning have dictated curriculum design and admissions to the universities for almost a generation, explicitly in some countries, implicitly in Canada and the United States. In North America, demand for higher education has been stimulated by the promise of increased material rewards offered by higher earning power. To the vast majority of consumers, education is seen as a means to an end, rather than an end in itself. Strangely enough, we may be entering an era when education as an end in itself is made available through the medium of expanded facilities for adult and continuing education. Strangely enough because although increased leisure time and material well-being make continuing education possible, the material rewards that society offers the consumer are beginning to be seen by increasing numbers of people as inadequate. We shall discuss this phenomenon in our section on alternative futures. Thus, it comes about that "the issues being raised (in higher education) have to do not so much with the growth of the schooling enterprise as with the very purposes of schooling itself, with their social value. The question is not so much what may be their contribution to

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(1) Green: in loc. cit.

economic growth, but what may be their impact on the quality of life." (1) With this in mind, we turn to a further examination of our own and alternative definitions of planning, and the assumptions underlying these definitions.

ALTERNATIVE PLANNING DEFINITIONS

The universal assumption underlying the concept of planning is the assumption of rationality. Like the economists (many of whom become planners), whose homo economicus makes rational decisions regarding his individual economic welfare, planners assume that individuals will respond rationally to their (the planners') rationalizations. The fact that this expectation falls short of reality is both demonstrated and partially concealed by the planners' fondness for physical planning, or their reluctance to move beyond it.

Rationality in its absolute sense means the integration and synthesis of all information regarding an object. Needless to say, we accept that the absolute is an ideal after which we may strive. We may also observe that in real life, rationality depends upon its object. It demands an end, although that end may be the means to some other end. In reality, we place constraints upon our rationality such that

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(1) Green: op. cit., p.9.

much of own social behaviour appears paradoxical, because rational activity is only rational in terms of the objective of the activity. Under a system of per-capita subsidization of university enrollments, and where that subsidization is the major part of its income, a university is bound to try to expand its enrollment to obtain increased funding. This is entirely rational in terms of that goal. However, if the effects of increased enrollment on the costs of maintenance and administration, capital expansion and quality of education, which in turn may negatively affect enrollment, are taken into account, the transaction has to show an overall credit balance in order to remain rational. Other information regarding that objective is either discarded as irrelevant or stored for future use.

"... when observing behaviour in a social system, we can ascribe a degree of rationality dependent on the following factors:

a) the existence of goals or problems to be solved;

b) the availability of information;

c) the ability to process or sift information

and to discard or store for future use that which will not advance the processor towards his goal or towards avoiding or solving his problems.

In this strictly limited sense there is little human social behaviour which is not rational". (1) In a nutshell, rational behaviour is governed by self-interest, and the scope of self-interest is governed by information regarding the immediate and long-term effect of that behaviour on the individual. That effect is then evaluated according to the individual's own value system and priorities. Thus, planning can be described in operational terms as: "... the activity by which the complex functional networks and manifold diverging interests (of society) are optimally integrated into an on-going process ... the devising of changing criteria of optimality is a constituent part of the planning process itself ... planning will have to play an important role in the processes of functional integration. In this way, planning is an activity which combines techniques with interests..." (2)

The reason for this discussion is that planners must take into account the political reality that the individual university functions as an interest group in society. It does not exist in a political vacuum. "The multiplicity

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(1) D.G. Ritchie: "The Western Model of Development: An Investigation of its Assumptions and their Effect on Development Planning, unpublished Master's Thesis, Harward Graduate School of Design. February 1972, p.52.

(2) E. Pusic: Power, Planning and Development, p.30.

of goals served by education presents in itself profound difficulties to "rational" policy analysis - as is also the case in most other sectoral policies. Education is supposed to contribute to economic performance, to increased mastership by the individual of his situation in society, to the securing of equal chances - maybe even the manifest acceptance of equal worth - of individuals, the transfer of a variety of values, etc. These are all goals officially cherished in most countries and more importantly, they all represent genuine values to groups which in many countries cannot be neglected. A politically viable balance has to be found". (1)

Political reality is reflected, as we have indicated, in the "relevance" of higher education in the view of the dominant interest groups in society. A dominant aristocratic and intellectual elite may view education as an end in itself, and its "relevance" as immaterial. A development oriented middle class may see higher education as a means to the end of an ever-increasing G.N.P. We argue in this paper that both thesis and antithesis have been presented, measured against reality, and found wanting. Synthesis is now being demanded by an interest group that has only just begun to show its political muscle - the consumer - represented

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(1) K. Eide: "Politics of Long-range Planning: The Strange World of Planners", in Green, Ed., Educational Planning in Perspective, p.14.

by the student himself and indirectly, by the public within whose community the university exists, and whose services it wishes to consume.

This gives rise to the need for a far more flexible approach to planning than has yet been demonstrated. (1) At the same time it demands a sharper focus on reality. To achieve this perspective we find it necessary to concentrate on process, and therefore on planning as a discipline of design and adaptation. Thus: "Planning is viewed as a logical problem-solving approach to the development of academic programs in an institutional setting". (2) And "... the planning process may be viewed in four simple steps: (1) goal identification; (2) physical analysis; (3) aggregate prediction; and (4) physical design... Educational planning may be thought of as an intellectual system involving a progressive study of the educational surroundings as they are affected by new ideas, physical change, alternative values, and cultural transformation wherein an intellectual system "may connote an ideal system". (3)

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(1) We would refer the reader to the discussion of planning definitions and context by E. Miklos in E. Miklos; P. Bourgette and S. Cowley: Perspectives on Educational Planning Human Resources Research Council, Edmonton, Alberta, 1972, chapters 1 and 2.

(2) C. Fincher: "Planning models and Paradigms in Higher Education", Journal of Higher Education, vol. XLIII, no. 9, December 1972, p.756.

(3) C.K. Tanner: Designs for Educational Planning: A Systemic Approach, D.C. Heath & Co., Lexington, Mass 1971, p.15.

Tiresome as the word "relevance" may now seem to the ears of educators, it still is of the utmost importance in the planning of higher education. Unfortunately, too often the idea is approached from within an emotional cloud of guilt and frustration. Far too much soul-searching is involved and confusion generated because the problem is attacked out of context and somehow separate from reality. It has to be understood that planning for higher education involves the process of education as well as problems of organization, and in this context, the problem of "relevance" arises from the interaction of the university with society, and impinges upon both the core of higher education - the curriculum - and upon the efficient and effective use of educational and organizational resources.

Fincher discusses the division of educational planning into two levels, but he does not make explicit their interdependence. "The distinction lies primarily in the recognition of one level of planning that is concerned with organizational or institutional goals and another that is concerned more directly with immediate, departmental, or developmental activities... Another distinction is made in an orientation to ends or mission, as in strategic planning, and an orientation to means or tasks, as in operational planning". (1) In terms of university functions, strategic or "substantive"

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(1) Fincher, op. cit. p.758.

planning "places a special emphasis on educational policy matters and specifies priorities among programs and curricula, methods of instruction, faculty selection, student admission, finances and facilities". Operational or "expedient" planning covers the area of "campus size, types of institutions, cost of instruction, space utilization, class size, and student-faculty ratios".

Fincher also discusses the difference between "efficiency" and "effectiveness". Efficiency deals with the operation or functioning of a process, such that there is no waste of the resources utilized. Effectiveness, however, deals with the outcome of the process or function, which must be measured against the objective or goal of the process. Thus, a process can be highly efficient with regard to resource utilization without being in the least bit effective. We would argue that efficiency must be subordinate to effectiveness in the field of higher education, and thus operational planning must be subordinate to strategic planning, although the latter is dependent on the former to effectively reach its objective. What is really required is that the two an explicitly linked and integrated. Techniques in modelling and organization which could make this possible are discussed in a later chapter.

The required paradig[illegible] for education planning is

best set out by Williams, who underlines the need for flexibility and broader long-term goals:

> "The aim of (planning) research should be to improve current operation of the system - not to try to provide a telescope for peering long distances into a murky future... What is misguided is to attempt to obtain a precise and accurate picture of the future more than a year or two ahead. Broad political and social orientations must be established by all concerned in the provision of education, but these will have no particular scientific basis - especially as ends and means in education are more than normally interrelated. <u>However, projections can be made which will give an indication of the path to set out on in order to move in the direction of the objectives</u>*. By the following year the projections will probably prove to have been wrong or the desired direction itself may have changed. This is harmless provided that the machinery exists to monitor accurately developments in the real system, to up-date the projections and base new decisions on the difference between the old and new projections and to implement them: or perhaps to make new projections in the light of the changed objectives. One year's decisions do no lasting damage to a system as education <u>providing that</u> they can be reversed if necessary during the following year". (1)

This argument leads us directly to the concept of planning as a design process (see figure 1). There is no ultimate objective in higher education, no final truth. There is, rather, a constantly changing optimum, which arises out of a synthesis of requirements and constraints at any given time. It is thus also a continuous resolution of an on-going conflict. "Optimization" and

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* our emphasis

(1) Williams; op. cit., p.388.

"resolution" are therefore synthesized to become the "relevance" that higher education is seeking, and "rationalization" is the design process.

In the next chapter we shall discuss the context of planning, which becomes the conceptual famework within which planning takes place, and which is fundamental to the assumptions made by planners.

PART TWO - THE CONTEXT

A World View

Quite apart from the normal demands that population growth makes upon the physical expansion of higher education and the constraining effect of inflation on those demands, changes in values and attitudes towards growth as an end in itself are making significant new demands on the provision and content of higher education.

> "Educational growth has been the evident and most visible change of the past 20 years. But other changes have accompanied that growth. They are undoubtedly less spectacular; but, on the other hand, they may be more far-reaching in their implications. In the first place, in nearly every country of the so-called Western world, the high hopes of the fifties and sixties that led largely to the expansion of educational systems have yielded to second thoughts about the efficacy of educational systems in attaining the goals of economic and social reform. As we enter the decade of the seventies, the assumptions that seemed so dearly to validate and justify policies of educational expansion seem less self-evident and less compelling than at any time in the last 20 years". (1)

Our assumptions and values are tied up in our collective view of the world, which in turn predicates our social behaviour.

In order to describe the context for planning, we must first discuss this world view since, we argue, it acts as a paradigm from which rational behaviour can be deduced.

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(1) GREEN, op.cit., p. 5.

It is a view incorporating an awareness of the systemic nature of reality. In a global system, man is an integral part of a global ecology - he is not above it. Whether he likes it or not, an order is being re-imposed upon him, an order within which he has to learn to live, and to find new non-physical avenues of expansion. Higher education, coupled with the communications and information "explosion" of the last decade or so, has, in a sense, been instrumental in re-imposing this order, through the expansion of knowledge and awareness, through the attainment of new heights of objectivity. Human society has fulfilled another intellectual cycle, from the collapse of pre-reformation cosmology to the imposition of a new one, not by means of metaphysics and theology, but by scientific objectivity. The current generation of problems is similar to that of the early years of the Renaissance - assumptions and values upon which the activities of the major interest groups in society are predicated are in direct opposition to empirically observable reality. The "growth ethic" of western society assumes that man is above nature, and that the world is made for him. It clearly is not. But however much we may protest that this is true and that we are aware of it, we still find it exceedingly difficult to behave accordingly. For members of a society to refute the justification for their struggle for existence it requires, short of revolution, at least a generational change in basic values and this is evidently

the intellectual and emotional background for the current crisis in higher education. The political reality of such a situation is self-evident.

The Contextual Components

Apart from the generational change in values, which is perhaps an adjustment of society to its changing environment and is an on-going process, the number of individuals living "outside society" is increasing. Guerreiro-Ramos describes the phenomenon in the following terms:

> "Under conditions where it is difficult to identify the agencies responsible for socialization, the individual sees society as something diffuse and feels abandoned to himself. Exposed to multifarious influences, the family and other institutions are unable to guide him. In this context, knowledge assumes a major new role in the guidance of people. Freed from the restricting prescriptions of consistent institutional agencies, the individual resorts to knowledge to understand the world and to orient himself. Knowledge gains a widespread social function, becoming the main corrective of the fading of "collectively practiced methods" of social life" (1)

This "parenthetical" man differs from the "marginal" man of development literature in that he deliberately puts himself outside society - "He deliberately tries to become an outsider in his own social milieu to maximize his understanding of it.(2)

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(1) A. Guerreiro-Ramos; "The Parenthetical Man" in Journal of Human Relations. Vol. 19, #4, 1971, p.469.

(2) Ibid., p. 471.

Marginal man suffers from a crisis of inclusion. With all the values and aspirations of bourgeois society, he is yet excluded from it, and his usual path to inclusion is through education and entrepreneurial activity. Parenthetical man, on the other hand, rejects the status-values and rewards of the society of which he is a part. "The locus of his self-direction is basically his ego, not the outside social world".(1) With no socially sanctioned external rewards or motivation, he suffers from a crisis of self-actualization:

> "The average man in the present advanced industrial society realizes he is losing competence in dealing with himself and the overall environment. Instead of improving the quality of life, technology, as an uncontrolled force, is exterminating man as a creature of reason. And since such an outcome is not inherent in technology, but derives from the episodical political and institutional framework of advanced industrial systems, a new level of human consciousness is becoming widespread which incites people (mainly the young) not to conform to adjusted patterns". (2)

The situation in the province of Quebec is illustrative of both types of crisis. The generation currently in power in provincial politics personifies the values and motivation of "The Quiet Revolution" which was (and still is) the resolution of a crisis of inclusion. A second class minority fought its

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(1) Ibid., p. 474.
(2) Ibid., p. 480

way to a position of power in the economics of the province, if not of the country. However, it was not a true revolution, since it did not incorporate an ideology. It was a fight to share in the rewards of the larger North American economic system, and thus strictly pragmatic. Once the objective of participation was attained, every effort has since been made to maintain that status. Thus materialistic values are strongly held, and may even take on the guise of an ideology.

The generation now entering higher education, on the other hand, is the <u>product</u> of the quiet revolution. More affluent, more self-confident, more sophisticated politically, and able to take for granted those rights and rewards that the previous generation fought for. Moreover, it is more acutely conscious of its individuality and of its cultural heritage. It will participate in the larger North American economy only on its own terms, and it tends to reject or at least modifies the highly materialistic values of its predecessors. The old adage "as soon as they get out into the real world they'll lose their idealism and knuckle under" is no more applicable in Quebec than it was in the United States. Education prevents it. Self-actualization is more the goal of the current generation of university and college students. But whereas in the rest of North America self-actualization is dispersed and highly individualistic, in Quebec it has the focus of an ideology - nationalism, and an objective - the protection of a cultural identity. The occur

rences of the past ten years have made the world of American culture distateful in the extreme, and since its transmission occurs mainly through economic influence, this distaste cannot fail to have far-reaching effects. Political reality may demand that the people be fed, clothed and housed at all costs, but it is <u>how</u> they are fed, clothed and housed which has the most far-reaching and pervasive effect of all.

The third major component of the context for higher education is increased leisure time and a demand for education (or knowledge) for its own sake. Extension courses in many non-academic areas have been available for some time. Technical advances in some fields appear to be creating a demand for periodic up-dating of technical and professional qualifications and, if businesses adopt a policy of giving employees time off in order to further their education, this will make an effect on both curriculum content and teaching loads, although the main thrust will be in the graduate and professional schools.

A fourth component is only just beginning to make direct demands on higher education, or rather on the concentration of facilities and skills that institutions of higher education possess. This is that part of the general public which is not normally considered to be a consumer of higher education. It has long been observed that concomitant with economic development, there is a rise in the level of political awareness and sophis-

tication of those affected by that development. This is seen as both a necessary condition and an unavoidable result by development planners and economists, since development requires widespread participation and participation demands increasing educational standards. Political awareness demands the ability to make an objective evaluation of one's possession of the rewards that a given society offers relative to other members of that society. It also demands the ability to recognize an interest in improving that relative position in common with other people in a similar position, consequently bringing interest groups into existence. Political sophistication demands understanding and skill in utilization of the political power inherent in such interest groups. When those groups do not obtain satisfaction through political means, more and more of them are turning to the law, either to block the progress of conflicting interest groups, or to obtain enactment of legislation which they see as reflecting their own interests. Enactment of legislation requires skilful argument and the expert collection and presentation of evidence by (if possible) an objective source. Institutions of higher education can be seen by interest groups in society as collections of objective, expert sources, with enormous facilities for gathering unbiased evidence (although it would be naive to suggest that evidence remains unbiased, since even experts have their own points of view!) This view constitutes a growing demand on the Services

of colleges and universities, and an important area of interaction between them and society, since society, in this case is more representative and has less class bias than the society represented by the students, their parents and alumni.

Relevance

Thus far we have outlined four broad interest groups which constitute or are about to constitute the major part of the current context of higher education in Quebec, in that they generate the heaviest demands on its institutions. These are the "environment" to which these institutions must react in order to survive. For many generations they have managed to exclude themselves from this environment, but a complex array of factors now preclude this independence, salient amongst which is the "de-mystification" of knowledge and thus the whittling away of ivory towers. We must now examine the problem of relevance in higher education, which is, politically, the expression of the demands of all four of the above interest groups. We have already stated that relevance is historically determined by the interest group in our society that holds the balance of power. We have also stated that planning is, generally, the design of an optimum path between divergent interest groups. Planning in higher education is, then, apart from the operational planning required for the day to day running of the institutions, the design of a curriculum which best reflects the needs of the interest groups providing its context.

Needless to say, the major demand underlying such a design has to be that of the advancement of knowledge. Relevance from the point of view of the advancement of knowledge is, however, an entirely different debate, and one that resolves itself. Empirically observable reality does not change. Interpretations of its nature and theories about its composition do change according to the points of view of the interpreters and theoreticians. The unveiling of each new fact or the unravelling of each new process, either in nature or in human society, serves either to reinforce or bring about the gradual destruction of a point of view. Kuhn refers to a point of view, when generally held by a scientific community, as a paradigm or model for behaviour in approaching or solving certain problems.(1) Students, when they question curriculum relevance, are questioning the ability of the knowledge offered them to help them in interpreting reality and solving its problems. They are questioning a paradigm on a very large scale. They are not questioning facts, but they are questioning the way in which they are interpreted, or the view-point which they are used to represent. When this view-point jibes with our current empirical understanding of reality, then it is in need of questioning. The result, after much agonized soul-searching is usually a shift in view-point by some of the holders of the original view-point,

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(1) T.S. Kuhn: The Structure of Scientific Revolutions. University of Chicago Press (2nd ed.) 1970.

and support of a new view-point by new contributors to knowledge. The old view-point is gradually discredited. This, we submit, is also part of the current context for educational planning.

From the current context, we shall now proceed to an analysis of possible future contexts for educational planning, and the development of a paradigm for problem definition and solution.

PART THREE - FUTURE CONTEXTS

Specialization

What we have stated in the previous chapter is, broadly speaking, that higher education is in the process of transition between a static general model of knowledge accumulation and a dynamic general model of supply and demand. This has had the result, in one sense, of making institutions of higher education more sensitive to their environment - but only to a part of the environment. That part is the job market, and the influences shaping it, with the further result that higher education has started to become yet another casualty of the mass consumption society - providing quantity without quality. Fortunately, as we have pointed out, the consumers of the services of institutions of higher education have begun to attack the values and assumptions of the mass consumption approach, with unforseen results - such as a falling off enrollments generally across North America. This decrease in enrollments has been aided and abetted, to be sure, by economic factors, and by over-production of specialists by the universities. But it has also been aided by a dawning recognition of the human bankruptcy of over-specialization.

The concept of specialization is endowed with the very narrow logic of efficiency; but man is not a cybernetic cypher, a closed feed-back loop, who carries on producing, oblivious of his surroundings, until he drops. He exists in an environment,

to which he reacts and adapts himself - as does any other animal - in order to ensure his survival as a species. However, when he is cut off from that environment by ignorance or by fragmented self-interest, he loses his ability to adapt, and the assurance of his survival is thus in doubt. Specialization and compartmentalization of knowledge, as well as occupation, re-inforces fragmentation of the intellect which in turn re-inforces the fragmentation of self-interest. We thus have an open self-reinforcing or growth feed-back loop which is very difficult to halt from within: Again fortunately, for us, external indicators from our environment in the form of rapidly depleting resources and the destruction or near exhaustion of our life-support systems, as well as large-scale human crises within our social systems as a partial result of over-population, are imposing themselves upon us. A particular exponential growth rate, that of specialization which has become over-specialization, is beginning to decay and will probably find an equilibrium point. This is mainly due to the fact that:

> "We are learning that no phenomenon can be isolated but has repercussions through every aspect of our lives. We are learning that we ourselves are a fundamental part of nature's eco-systems. And that the systems we create inextricably tie into existing systems. We are at the point of having a conscience about our reactions - to counter our long history of blind and wilful freedom with a more responsible concern. This is by far the most provising development of our recent history". (1)

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(1) A. Erikson: "Today's Profound Revolution of Western Man." Business Quarterly, Winter 1972, p.55.

Empirical observations of the environment are beginning to translate themselves into political issues, as the power of the groups in society whose interests are vested in the continuation of "blind and wilful freedom" is challenged. In order to retain power, these groups may compromise until their basic values are radically changed, or they may resist all change. Whatever the outcome of the struggle, it is evident that our values must change, and it is against this background that we propose to examine the future context of higher education.

The Nature of Man

Underlying the pragmatic issue of survival, which we believe will be the major determinant for this future context, there is, however, an even more fundamental issue which we must examine for its philosophical implications. This issue concerns the nature of man and must form part of the paradigm for his future behaviour. In other words, it is fundamental to the development and construction of a cosmology to replace that which was destroyed during the renaissance, and, although it is not within the scope of this paper to discuss this issue in depth, it has an obvious bearing on the acquisition of knowledge, and thus on education in general and higher education in particular.

There are currently in existence two contemporary schools of thought regarding the nature of man. These are as follows:

> "The behavioristic model: Man can be described meaningfully in terms of his behavior; he is an information transmitter; he lives in an objective world; he is rational; he has traits in common with other man; he may be described in absolute terms; his characteristics can be studied independently of one another; he is a reality; he is knowable in scientific terms".
>
> "The phenomenological model: Man can be described meaningfully in terms of his consciousness; he is unpredictable; he is an information generator; he lives in a subjective world; he is arational; he is unique alongside millions of other unique personalities; he can be described in relative terms; he must be studied in a holistic manner; he is a potentiality; he is more than we can ever know about him". (1)

These are two extreme points of view, each illustrating a theoretical doctrine. Common sense and empirical observation tell us that reality is best described as a synthesis of the two worlds, closer to Guerreiro-Ramos' Parenthetical Man, or the model implied by Kohlberg and Mayer's progressive developmental ideology. We could argue that the nature of man is determined by his understanding of his environment and the ability that his genes give him to survive in that environment. We would also argue that the more man understands his environment, the more he understands himself and his own behaviour. From a holistic view-point, man acts irrationally in his individual self-interest, and rationally only in terms of the survival of his species. When entropy or disorganisation is at a very high level in his

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(1) W.D. Hitt: "Two Models of Man" in American Psychologist July 1969.

social systems, he is at his most vulnerable and most likely to act only in his own self-interest, in a spirit of "sauve qui peut". Only when he has developed a structure within which to act that encompasses his total environment, including the interrelationships between its parts, will he be able to decrease the entropy in his social systems and create an energy-base for the next phase in his struggle for survival.

Some may argue that this discussion is not particularly relevant to higher education problems, but it is the avoidance of these fundamental philosophical issues by the planners and by educators themselves which has brought about the present period of acute discomfort. We could argue that coherent planning at other than a purely operational level is impossible without an explicit debate on these issues. We would further argue that a generation of graduates, drop-outs and other educated persons is about to enter this debate and we would suggest that the demand for skills and knowledge pertinent to the development of a cosmology will be the second major force shaping the future of higher education. The simple realisation of the vulnerability of our species will demand this, technological advances notwithstanding. Specifically, incorporating both the pragmatic and philosophical issues:

> "We must put vastly more emphasis on educating for certain intellectual abilities. We must educate people to have long-range perspectives, to think in terms of many variables related to

> each other as probabilities rather than certainties and related as to both cause and effect of each other. We must educate for logical skill in recognizing and working through the ethically and morally tortuous dilemmas implicit in the assignment of social priorities and in the risks involved in seeking to attain them. This logical skill must be complemented by deep familiarity with the history of ideas and of comparative ethics, since the recognition and resolution of ethical issues is as much a matter of extra-rational factors - historical accident and traditional values - as of purely rational assessments. We must educate so people can cope efficiently, imaginatively and perceptively with information overload". (1)

We must reiterate at this point our emphasis that all planning has little value, in fact does not qualify as planning at all, until it has some kind of long-term direction. It is this long term direction, however, which is most difficult and painful to establish, since it requires a thoroughgoing examination of assumptions and values. It is unfortunate to notice in the literature that very few educational planners pay more than lip service to this issue, and of those that do, we have remarked only one that has performed a thoroughgoing analysis of current values and has projected future contexts based both on those values and the values predicated on Hitt's two models of man. This is the article "Nature of Our Changing Society: Implications for Schools", by Willis W. Harman [2] in Part I of

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(1) D.N. Michael: The Unprepared Society. Basic Books, 1968, p. 108.

(2) W.W. HARMAN: "Nature of our Changing Society". Implications for Schools." in Fiele, Eidell & Smith, Eds. Social and Technological Change.

Social and Technological Change: Implications for Education.[1] and upon which a substantial part of the rationale of the Government of Alberta's Report on Higher Education is based.[2]

In Harman's article, he summarizes the trends upon which "More or less general agreement is found among forecasters with regard to the major components...".[3] These are seen to be inevitable and the relevance to higher education is indicated in the nature of the problems which will arise from the conflicts inherent in the trends.

He divides them into four broad areas: Economic-Political; Scientific-Technological; Social-Ecological; and Cultural-Psychological. Under the first area, worldwide industrialization and modernization is seen to predominate, with the bulk of activities in the less developed countries.

> "The economic development of the world will almost surely not be accomplished smoothly and according to plan. The process is likely to be marked by profound 'revolutions of rising expectations', disharmony and social discontent. The almost inevitable gaps between expectations and accomplishments may well breed political authoritarianism and economic collec' 'vism".

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(1) P.K. Piele; T.L. Eidell and S.C. Smith; Eds.; Social and Technological Change: Implications for Education. Center for the Advanced Study of Educational Administration, University of Oregon, 1970.

(2) A Choice of Futures, A Future of Choices - Alberta Commission on Educational Planning: A Choice of Futures - A Future of Choices. Alberta Queen's Printer, 1972

(3) Harman; op.cit., p. 5.

> The jump in educational attainment from a tradition bound peasant society to a modern industrial one is immense. Strong infusions of knowledge as well as capital will be required if the underdeveloped world is to succeed in this ambitious attempt". (1)

In Quebec, there is a political-economic trend of "development at all costs" which demands the counterbalance of an educated society, in which education does not equal specialization; and the development process demands the participation of professionals whose sense of responsibility to society as a whole incorporates an understanding that Quebec is, in reality, a geo-political region of the North American continent. Higher education in the province bears the responsibility not only of providing the means for training such professionals, but of imposing upon them the awareness of this reality.

Harman also mentions the institutionalization of change in which change is viewed as an end in itself. The reality of this situation is, however, that change is a reaction, a means of finding a way around an obstacle rather than an end. It is highly likely that organizational forms adapted to institutional design and problem-solving will be institutionalized, and that as constraints to human development appear in the environment, so will these institutions recommend action or non-action. But change is unnecessary without cause.

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(1) Ibid., p. 6.

The article envisions the emergence of a "knowledge society", which we have already touched upon in this paper. Briefly, the prospect is likely "of a 40 (and more) - hour week for the 'knowledge workers' and unemployment for the untrained. There will be an expanding portion of the populace involved in education and an increasing percentage of the national income going to education. There will also be an increasing involvement of education with other social institutions". (1)

In the scientific-technological area, the trend of accumulation of scientific and technological knowledge is almost certain to continue. However, there is likely to be an increasing lag between technology-created problems and technological solutions until a global ecological viewpoint is achieved. The approach of government and industry to the James Bay Project is a powerful illustration of this trend in Quebec, whilst a model example of what should be done beforehand is the Ste. Scholastique ecological and social survey conducted by the University of Montreal. In this area, institutions of higher education in Quebec, as a unit, have a responsibility to become politically involved, since it is both in their own and the public interest to do so. They must take the initiative in

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(1) Ibid., p. 7.

proposing and lobbying for studies of this nature. It is obvious that it cannot be done by individual institutions, since in this case the individual would be highly vulnerable.

Social-ecological trends cover the growing problems of ecological balance, environmental deterioration, population concentration and food supply. The interrelationships between these trends and the previous two groups are dramatically demonstrated in D.L. Meadows' Model of the global environment. In his book, published in French as Halte à la Croissance by Fayard of Paris, the concepts of exponential growth and indirect causality are explained to point out how those interrelationships occur. This methodology will be discussed in part four of this paper in relation to simulation of environmental systems. The necessity for basic shifts in values is emphasized by this perspective, and we have already pointed out the political context for value change in our discussion of relevance and rationality in part one.

Affluence will continue to increase, in terms of present trends, as will the relative gap between rich and poor. Some forecasters see a tendency for the concentration of intellectuals and technical experts in bureaucracies and corporate structures, forming a knowledge elite. This may well be the case in view of continuing specialization and fragmentation

of knowledge, and "Cybernetic behaviour" by intellectuals. In any society, and in Quebec in particular, this can only be countermanded by the concentrated (and thus political) opposition of the universities as an interest group.

Harman also envisions an increasing interdependence of social and political institutions with international coverage. The overtly economic, covertly political institutions in the shape of multinational corporations are seen by this writer as particularly important in the future, whether for good or evil. One scenario might see them as the future saviours of humanity and preservers of the earth's diverse cultures in a coming Dark Age. Another scenario might see them as the very perpetrators of a Dark Age, in the evolution of a desperate mercantilism as the earth's dwindling resources are squabbled over. It is quite evident, come what may, that they are in a position to challenge national governments of less developed countries, and certainly to strongly influence, if not outrightly run the governments of Western nations. It is imperative that their behaviour is analysed and understood, particularly in the resource-rich province of Quebec. Again, collective political action will be demanded of the institutes of higher education in the future if studies of this nature are to be forth-coming.

In the cultural-psychological area, we have already discussed the appearance of "Parenthetical man", a normative model which, we feel, effectively synthesizes the previously

described dichotomous models. However, this trend towards self actualization will be accompanied by great stress or what is known as "cognitive dissonance", in individuals as roots and values are transferred from external material to internal self-realization concepts. This will probably call for great flexibility in educational goals, and will certainly demand individualization of programmes. It may well be that the adjudication of competence in technological and administrative skills will have to return to industry, or that the professional schools will have to retire from the campus.

Harman provides two contrasting forecasts of future society, implicitly predicated on Hitt's two models, which we include in Appendix A. Their rationalization is as follows:

> "The first assumes a relatively continuous transition from the 'first-phase' industrial society, which has so far lasted from the Industrial Revolution to the present, to the 'second-phase' computerized, cybernated state. Implicit in this transition is the further assumption that such trends as the expanding economy and the advancing technology have, so to speak, a life of their own. That is, once set in motion, their dynamic nature carries them forward". (1)

> "The second forecast, the person-centered society, assumes, by contrast, a significant discontinuity with past treads. Its proponents tend to view our present time of troubles as a transition period to a state radically different from the present, both in institutional forms and institutionalized values. The level of technological development would be comparable

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(1) Ibid., p. 14.

> with (or somewhat lower than) that in the first forecast, but the uses to which technology would be put might differ significantly. The value shift would be in the direction of a more 'person-centered' culture. Critics of this forecast would say it is unrealistic; critics of the first forecast would say it is undesirable, if not self-destructive". (1)

He adds that in both of these forecasts it can be assumed that certain trends will continue, at least into the near future. The first is a high and increasing level of technology and cybernation, and thus automation, and the second is "the conduct of most purposeful activities by large-scale centralized organization, such as those developed in government and industry in recent decades." We have already dealt with some of the implications of this trend. The discovery of others would need further large-scale research which is outside the scope of this paper. The growth of the political-military-economic complex of the United States may well be indicative of developments in other countries, particularly where power and capital are heavily centralized. In Quebec, the danger lies in the political-economic field.

Complementary to these two forecasts, we have included at Appendix B a description of an "ideal state of society" or, perhaps, a "most suitable state".

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(1) Ibid., p. 16.

This concept arose out of a seminar sponsored by the Canadian Commission in the Summer of 1972. The topic of the seminar was "The Stable State", and the group consisted of fifteen participants from academic and professional backgrounds, representing a wide spectrum of points of view. This description is included to demonstrate the possibility of developing clear alternative goals, at least in theory, between divergent viewpoints. At the very least, its usefulness lies in forcing fundamental assumptions to the surface, even though the outcome may be Utopian.

Future Demands

In attempting to describe future contexts for higher education, we have not, as we stated in the introduction to this paper, attempted to forecast events or make a quantum leap into the future. That is impossible and thus futile at the present time. We have tried to outline the limitations of our current value system and its assumptions, and, against a background of the increasing constraints that our environment, both physical and intellectual, is imposing upon us, to describe the fundamental demands that will be made on our intellectual and conceptual ability, and upon higher education in the future. Thus, in summary, the future crisis-oriented context for higher education in Quebec will demand:

(A) a problem-solving approach to education which will in turn demand a considerable increase in inter-disciplinary co-operation

from which there will arise new fields of study. It will also demand a concomitant decrease in disciplinary autonomy.

(B) a first-cycle curriculum in universities which will prepare students philosophically and ethically for both rational decision-making in society, self-actualization and participation in second and third-cycle programmes and professional schools.

(C) accessibility to higher educational facilities for all, regardless of whether they view education as a means or an end. The only demand for academic qualification would be from those that view education as a means.

(D) the recognition of institutions of higher education that they form an interest group and thus a political entity in society, and that they must accordingly act in concert in their own interest.

(E) the recognition that institutions of higher education, as a unique grouping of intellectual skills and facilities, have a responsibility to act, in concert and full cooperation with the public, in the public interest.

PART FOUR - TECHNIQUES

Policy Directions

In our discussion of current and future contexts for higher education, we have concentrated on underlying values and assumptions, and the dialectic nature of social processes. We have also emphasized the political expression of these processes through the formation of interest groups in Society, and have identified the collective institutions of higher education as such a group. We have stated a long-term policy objective in Quebec as the provision of relevant higher education and we have defined planning in higher education as the rationalization of the means by which that objective is reached. It remains to us now to examine the rationalization process. This we shall do by analyzing the technical needs of long-term policy planning - strategic planning in terms of the nature of the context we have described. We shall then examine the basic needs of operational planning and suggest a synthesis of the two.

At this point it may be useful to turn to table 1 in the text. In it there are characterized five distinct policy directions. We are specifically concerned with the last two

as being the most relevant to higher education policy both now and in the future, in as much as higher education policy can be determined by the institutions of higher education themselves, acting in cooperation with each other. It must be clear by now that we deem cooperation a vital, pragmatic necessity, and not simply an ideal.

These two policy directions are increased efficiency at all levels and qualitative improvements in education. The other three categories we classify as external to the institutions, since they may be correctly expressed as environmental constraints, or external demands on the system of higher education. This is not to say that they are any less important, since they have to be taken into account both in operational and strategic planning. However, we are concerned here expressly with planning as a design process, and as a rationalization of the means to the end of relevance. This means that we must concentrate on institutions of higher education as adaptive, dynamic systems which react to signals from their environment in order to preserve their two major functions - the provision of relevant education and the discovery and transmission of knowledge.

Table 1. The Context of Educational Planning

Characteristic Features of Educational Policy	Situation	Objective of Planning	Focus of Planning Activities	Structures for Planning	Outcomes of Planning	Difficulties and Shortcomings
Expansion and Extension of Formal Schooling	Increased demand for education; pressure for upward and downward extension of schooling. Increased need for financial, human, and material resources	Provide places for all who wish to enroll; manage and control orderly growth and development; forecast needs and devise means for meeting the needs	Demographic forecasts; identification of feasible targets; monitor system through accounts, mapping, identify factors which influence demand	Specialized planning units associated with Ministry; commissions and advisory committees; limited planning at lower levels	An educational plan: predicted enrollments, needed facilities, costs; policy alternatives for meeting the demand	Technical problem of predicting demand; isolation of education planning from other planning, ignores problems of content and efficiency
Education as an Instrument of Economic Policy	Education considered to be important in stimulating economic growth, period of industrialization or occupational shifts, education viewed as an investment in human resources	Develop plan for educational expansion in terms of economic objectives, determine future manpower requirements and implications for training; determine optimal levels of investment in education	Project manpower requirements from growth targets, develop supply-demand models; cost/benefit analysis and rates of return studies	Interdisciplinary planning groups at upper decision levels; linked to other planning units, perhaps, no provision for planning at lower levels	Long and short term plans for economic and educational expansion; targets and policy alternatives for achieving targets, manpower forecasts	Estimating future needs and occupational structure; gap between planning and policy decisions; estimating benefits of education, ignores quality of education and content of curriculum
Education as an Instrument of Social Policy	Continued disparities in spite of expansion, differential participation and success rates; equality or other norms applied to education; active social policy	Identify causes and sources of disparity; identify factors which inhibit achievement of goals; develop policy alternatives	Collect data on participation rates and other conditions; develop indexes of extent to which goals are achieved; set targets and devise policy implementation	Centralized units responsible for data collection and analysis, research, adaptation of the programs at operational levels; more dispersed planning	Information on the extent of disparities, policy and program alternatives for reducing disparities	Precise definition of social objectives, developing effective policy instruments, motivating individuals to take advantage of opportunities
Increased Efficiency at All Levels	Rising costs of education and increased competition from other social services, pressure for demonstrating goal attainment; perceived lack of efficiency	Develop effective means for setting priorities and managing programs; increase system productivity	Goal-setting processes, indicators of performance, simulation, systems analysis, cost-effectiveness studies, budgeting systems	Planning carried out at all administrative levels: national, regional, and local; macro and micro planning, structures for coordinating education services	Objectives or alternative objectives specified; preparation of strategic decisions cost-effectiveness evaluation of programs	Defining objectives; developing procedures for setting priorities, assessing costs and benefits of alternative combining coordination and flexibility
Qualitative Improvements in Education	Pressure to reshape entire system, emphasis on adaptation and change, desire to make system more effective in terms of a broad range of goals	Inject qualitative concerns into quantitative planning, modify educational experiences, develop alternative futures and strategies for attaining them	Quantitative and qualitative forecasts, Monitor present policies and practices; research and development, develop policy planning links and information systems	Planning function dispersed throughout the system, participative, decentralized structure; centralized information processing, specialized units for forecasting, research, etc.	Strategies for organizational improvement and goal attainment, discussion and debate of policy alternatives; a more innovative, adaptable system	Reconciling highly participative decision making and efficiency, obtaining involvement, combining coordination with flexibility

Source: E. Miklos: "The Context of Educational Planning" In Miklos, Bourgette and Couley; Eds.; Perspectives on Educational Planning. Human Resources Research Council, Edmonton, Alberta, 1972, p.15.

Need for Simulation

In order to carry out these functions, the institutions need to be able to anticipate a range of possible situations in their environment to which they may or may not have to react. In the absence of a crystal ball, the only alternative tool is the simulation of the environment, and an examination of a range of outcomes which result from a range of probable combinations of decisions in that environment. This, we may say, has always been the goal of simulation, but here we encounter a serious obstacle to its success. Too much is demanded of it. We tend to base policy on the certainty of these outcomes when:

> "We need to learn how to redirect the "scientism" of decision - making methodology and theory into a more realistic recognition of uncertainty. We yearn so strongly for the security of certainty in our actions that we do not hesitate to construct artificial supports which give the appearance or illusion of certainty.
> "The quantitative methods developed and applied to physical systems have been adapted for social systems because they so powerfully appeal to our longing for certainty. Unfortunately, statistical probability often is used to suggest the surest pathway rather than to underline the high degree of uncertainty. By narrowly defining the boundaries to accommodate quantifiability and then developing probability factors, we are prone to accept the highest probabilities as if they were certainties. Somehow we need to become more comfortable with uncertainty, and recognize a variety of possible outcomes". (1)

1. C.L. Williams, jr. "Inventing a Future Civilization". The Futurist, August 1972, p.140.

To illustrate this bias, and the need for simulation of dynamic systems we turn to a discussion of the difference between strategy and tactics. An army general staff planning an extended campaign may use model battlefields and toy soldiers and equipment to develop strategy. At this point the planners are only interested in relative strengths, and the most probable behaviour of the opposing generals in order to estimate the maximum strains and stresses to which their own forces will be subject. They try and forsee every possible move that their opponents will make, estimate their requirements to oppose the most likely, and ensure that they have sufficient reserve strength and contingency plans, to oppose even the least likely. At least, that is what the planners are supposed to do. In the more immediate sense, tactics are developed on the basis of incoming intelligence during a battle in order to gain a short term objective, such as gaining possession of a strong-point. Winning the battle may be part of the campaign strategy, but data concerning precise quantities of opposing troops and equipment may not have been obtained until very shortly before it. The point made, or even belaboured here, is that only relative quantities or strengths are required at the level of strategic planning, since future <u>behaviour</u> is far more important at that level. In operational or tactical planning, however, those

relative quantities usually have to be translated into precise amounts of data. In pressing our case for simulation, we should like to point out that the technique is inadequate at the operational level. Unfortunately, most attempts that have been made to use it have been at that level; this use has generated a certain amount of mistrust. We would strongly advocate its use at the strategic level, bearing in mind Fincher's categorization of levels of planning in higher education. Its usefulness is readily demonstrable in the discussion (in some cases raging controversy) that has been provoked by Meadows' The Limits of Growth (Halte A la croissance) in which a dynamic simulation of a global ecology has been developed, using a modelling technique which will be described shortly.

Counter Intuitive Behaviour

In our view of the behaviour of our societies, we tend to think intuitively. We see only one level of direct cause and effect, and are usually unaware of, or worse, ignore indirect causality. This is possibly a result of our past training in logic and perception, but whatever the cause, our societies do not tend to respond to our intuitive expectations. In order to revise our expectations, we must make our awareness correspond to reality, and attempt to map out the non-intuitive behaviour of our social systems:

> "The human mind is not adapted to interpreting how social systems behave. Our social systems belong to the class called multi-loop non-linear feedback systems.
> .....Evolutionary processes have not given us the mental skill needed to properly interpret the dynamic behavior of the systems of which we have now become a part. In addition, the social sciences have fallen into some mistaken "scientific" practices which compound men's natural shortcomings ..... impossible tasks are attempted while achievable and important goals are ignored". (1)

This is a powerful argument for the use of simulation to permit the understanding and prediction of counterintuitive behaviour.

The major constraint on simulation is that it is a <u>policy tool</u> from which strategic goals may be derived to form the framework for operational objectives. In turn, the limitation on even the most sophisticated operational techniques is their short-term effectiveness. Quantitative projections develop an inoperable margin of error after, on average, a two year time-span. To effectively link strategic with operational planning, it should be clear that there must be an

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1. J. Forrester: "Counterintuitive Behaviour of Social Systems". <u>Technology Review</u>, Vol.73, No.3, January 1971.

Table 2. Qualitative Approaches to Educational Planning: An Overview

Types of Planning	Situation	Objective of Planning	Focus of Planning Activities	Structures for Planning	Outcomes of Planning	Difficulties and Shortcomings
Innovation	Affluent societies tend to put emphasis on quality of experience for the individual, inability to solve many of our social problems, tendency to define education as a crisis, emphasis on innovation occurs during times of rapid change	To produce alternatives in education which are more appropriate to the times, underly, incremental change, introduce new structures, ideas, methods or devices	Emphasis on problem definition, development, testing and evaluation	Emphasis is usually on a temporary decentralized management of innovation, however some writers have called for institutionalization of change, in many cases innovations have been forced on the system from the top down	Piecemeal changes in many areas of education since least important changes are easiest they tend to take place most often, provided field of education with a greater readiness to try new methods, however because of short range outlook there has been a high failure rate for new policies	Problems of incentives to get people to change has been overlooked, little evaluation of innovation exists, because we do not understand the process of change unanticipated consequences occur, little attention is paid to non-educational variables
Technological Forecasting	Evolution of specialized institutes, western societies tend to hope that technological developments in the future will solve the problems and crises of the present, greater awareness of the future	To research and formulate alternative technological solutions to the educational problems of the present	Research, exploration and speculation; trend analysis, trend correlations, scenarios, morphological analysis, delphi, relevance trees; logic networks, cross-impact matrix	Activity has been very much restricted to specialized institutes, effective integration with planning function in education is still to be achieved	Introduction of new instructional technologies; development of new research techniques for exploring the future	Tends to overlook political, social and cultural variables of the future, lacks an intricate analysis of futures history
Alternative Futures	Growing awareness of problems of bias in both quantitative and qualitative planning approaches, readiness of society to look at economic, political and cultural systems different from its own	Expand the future by opening up the present to new ideas and new models, relate non-educational factors to the future state of affairs to educational policy making and planning in the present	Multi-dimensional goal assessment and alternative strategy considerations, emphasis on continual process of self-criticism; makes use of tools mentioned under technological forecasting plus all the tools of quantitative planning, tools for analysis of futures history must be developed	Activity has been restricted to specialized institutes, theoretically this approach calls for participation by all groups at all levels in the system, effective integration with the planning function in education is still to be achieved	Has provided education with a broader focus to problem; effects on change not yet determined	Lack of analytic and planning tools to facilitate and support a consideration of alternative goals, non-methodological weaknesses, our inability to tie it effectively to policy and planning decisions

Source: P. Bourgette; "Qualitative Approaches to Educational Planning" in Miklos, Bourgette and Cowley, Eds.; Perspectives on Educational Planning, p.47.

open line of communication between strategic and operational levels of planning: "In an efficient planning process ..... there is a continuous flow of information from the system through the planners to the policy groups and from the policy groups through the administrators back to the system".(1)

Shortcomings of Planning and Simulation

Turning to table 2 in the text, a summary of qualitative approaches to educational planning, we can readily see that the major constraints on planning effectiveness are, reading down the right hand column:

- lack of understanding of process of change.
- unanticipated consequences of actions (counterintuitive behaviour).
- disregard of political, social and cultural variables of the future.
- lack of effective tools to support a consideration of alternative goals.
- political ineffectiveness.

It should be noted that the implications of these constraints are all strategic, apart from political ineffectiveness which concerns implementation. It should also be noted that under the

1. Williams: op. cit. p.389.

heading of "Focus on Planning Activities" in column four of table 2, there is no mention of simulation specifically, although it could be included under alternative strategy considerations. This is an important ommission, since simulation is one technique that can successfully link qualitative and quantitative variables, when it is based on the logic of relativity.

The major criticisms that are registered against simulation are as follows:

a) High cost of data collection which leads to
b) High level of generalization and
c) Restriction on frequency of iteration
d) Non-treatment of time as a variable
e) Difficulty of calibration
f) Disappointing results (lack of realism).

We could suggest that these criticisms are a result of attempts to use simulation techniques in operational planning. If simulation is used in policy planning and linked to operations by careful monitoring of sensitive parameters, as suggested by Williams (1), then it can become an extremely powerful tool.

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1. Williams: in loc. cit. p. 388.

Advantages of Simulation

In reply to these criticisms, we enumerate the following advantages of simulation. Data for simulation is, or can be verbal description, depending on the use to which it is put. When, as we have suggested, system behaviour is simulated, the design of a model is dependent on the designer's observations. Furthermore, this type of model can test for sensitive parameters simply by manipulating variables, without depending on statistical correlation. For example, we may find that when the quantitative difference between two variables reaches a certain size, it may bring into play other variables, or affect a parameter. What we are interested in here is not the actual measure of the variables and parameters, but their relative measure - in other words, the relationship between them, or how they affect one another. This is analogous to the engineer's model in a wind tunnel, or the hydrologist's model of a watershed.

There are two major types of simulation - the stochastic or probabilistic type, in which causation is replaced by probability; and the difference equation type in which the process of change is seen as the difference between a real state and an ideal or goal state. If we synthesize the two types, the probabilistic statement can describe parameters, or variables whose behaviour we do not wish to model, but the system description and dynamics must be realistic, and are best represented by dynamic or time-varying systems of difference equations.

The reality of our dynamic social systems is very complex. However, its complexity consists of the interaction of multiple variables with differing rates of variation; the actual processes of variation, or change, are relatively simple. The "moving parts" consist of an "ideal" or goal, an "observed real state", which is the informed assessment of reality against which the processor compares its goal, and a "true" state of reality, which may be used to adjust the observed real state. There are time delays of different and often varying lengths between each of the steps in the process of feedback, which is described as follows:

> "The feedback loop is a closed path connecting in sequence a decision that controls action, the level (state or condition) of the system, and information about the level of the system, the latter returning to the decision making point.
>
> The available information, as it exists at any moment is the basis for the current decision that controls the action stream. The action alters the level of the system. The level* (true level) of the system is the generator of information about the system, but the information itself may be late or erroneous. The information* is the apparent level * of the system which may differ from the true level. It is the information (apparent level), not the true level that is the basis for the decision process.
>
> Information is itself one of the levels of the system. The information changes as it becomes evident that the information differs from the true variable that it is presumed to represent. Information is not determined by the present true condition, which is not ins-

* Our emphasis.

> tantaneously nor exactly available, but instead by the past conditions that have been transmitted, analyzed and digested. The discrepancy between a true system level and the information level that governs decisions always exists in principle. As a practical matter, the information is sometimes good enough that no distinction is necessary between true and apparent level". (1)

It is in the dynamic nature of our social systems that our intuition and intellectual training bog down, for although we may be able to conceptualize multiple variables interacting in social space, and replicate those interactions with computer models, we have found it overwhelmingly difficult to incorporate time variance of the individual rates of change of those variables. When our focus is on the nature and behaviour of our social systems, that time-variance is of the utmost importance. We have tended to treat time implicitly, as the length of an iteration period during which interacting variables function as systems of simultaneously solved equations. This is patently unrealistic, as the careful examination of any process of a minor degree of complexity will show.

The flow of any commodity through our social systems - be it students, books, cars, capital or even information itself,

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1. J.W. Forrester; Principles of Systems. Wright Allen Press, Cambridge, Mass. 1968, pp. 1-7 to 1-10.

is governed by information. When we map the communication networks, formal and informal, that provide information to govern the processes in society, we have made a major step towards increasing the reality of our replications, and improving our ability to create successful, informed long-term policy. Information feedback loops are perhaps some of the most important structures of the social fabric. Without them, society can neither adapt nor maintain a status quo. We have added at appendix C, three examples of this type of simulation incorporating feedback loops. The first two are explicitly dynamic (i.e. time varying). The third is not but has been included to demonstrate its applicability to higher education institutions. Its conversion to a dynamic model can be easily envisaged.

Operational Linkages

Further to our earlier statements on the misuse of simulation, we would like to add some of Forrester's remarks which we feel will clarify our position.

> "The validity and usefulness of dynamic models should be judged, not against an imaginary perfection, but in comparison with the mental and descriptive models which we would otherwise use. We should judge the formal models by their clarity of structure and compare this clarity to the confusion and incompleteness so often formed in verbal description. We should judge the models by whether or not the underlying assumptions are more clearly exposed than the veiled background of our thought processes. We should judge the models by the certainty with which they show the correct time varying consequences of the statements made in the mo-

dels compared to the unreliable conclusions we often reach in extending our mental image of system structure to its behavioral implications. We should judge the models by the ease of communicating their structure compared to the difficulty in conveying a verbal description.

By constructing a formal model, our mental image of the system is clearly exposed. General statements of size, magnitude and influence are given numerical values ... Models are then to be judged, not on an absolute scale that condemns them for failure to be perfect, but on a relative scale that approves them if they succeed in clarifying our knowledge and our insights into systems". (1)

The linkage between a dynamic system simulation for strategic planning and the techniques utilized at the operational level consists of the information provided by short-term operational projections and constraints determined by efficiency requirements. These appear as levels in the simulation models. The apparent parameters of operational projections may appear as variables at the strategy level. Thus there is a two-way flow of information.

Table 3 lists the more important techniques available to educational planners. From our point of view, the coordinated use of the last three techniques on the list would

1. Ibid, p.3-3.

TABLE 3

Educational Planning Techniques

Technique Descriptor	Function
Bayesian Statistical Decision Theory	Evaluation of student achievement; estimation of long-range program effectiveness, and short range assessment of program components
Cost/Effectiveness Analysis	Allocation of resources, program planning, program evaluation, curriculum revision; explanation of resource allocation to policy makers; and intra-program comparison
Forecasting	Long-range evaluation of program; prediction of student population trends; long-range budget analysis; definition of long-range aims and immediate objectives; prediction of policy variables, staff requirements, forecast facilities needed
Simulation	Provision of feedback for program design based on expected behavioral changes; facilitation of planning by presenting alternative routes for policy formulation; training personnel
Critical Path Method and Program Evaluation and Review Technique	Scheduled review of objectives, program analysis, budget development, and project monitor; early identification of trouble spots; facilitation of statement of objectives and task definition
Linear Programming	Allocation of resources, optimization of budget expenditures; Computerized school lunch menu planning

Source: C.K. Tanner: Designs For Educational Planning: A Systemic Approach. D.C. Heath and Co., Lexington, Mass. 1971, p.10.

suggest an optimal arrangement. However, adoption of any technique would depend upon individual needs of the institution and the cost involved. A detailed description of the techniques is available in the source cited.

We would like to point out in the meantime that effectiveness can only be achieved through good design, and good design can only be accomplished if all possible demands are taken into account. The anticipation of all possible demands is the major task of planners in higher education.

CONCLUSION

In conclusion, we refer once again to the parallels between our current crises and the crises of the early Renaissance years. The rejection of Copernicus' paradigm - that the sun does not revolve about the earth, but the earth revolves about the sun, and that the universe is comprised of such suns and their attendant planets - was a political one rather than are intellectual one. Evidence of its correctness was easily enough obtainable simply by looking through a telescope, but the dominant interest group of the time could not accept it because it attacked the assumptions and values upon which its ascendance was predicated and assured. The Church, acting as a body politic at that period of its history, maintained a position in the hierarchy of men's order of things second only to God, based on the assumption that God created man in His image, and made the world for him so that he could carry out His works. The Church's political power rested on universal acceptance of this doctrine, and, the Reformation and some five hundred years notwithstanding, that assumption, however

rarely explicitly stated, underlies our attitudes towards our continuing existence in time and space to this day.

The vested interests of our modern society have to act with considerably more subtlety, since they cannot simply suppress information and get away with it for long. However, anybody can ignore information that could cause actions contrary to their interests. It is then the responsibility of other affected interest groups in society to persuade the reluctant party to take action that would be beneficial to the larger society. This can be done through a variety of means, ranging from verbal argument through political process, litigation and, as a last resort, violence. The measure of the degree of pressure required to obtain action would also be a measure of the degree of polarization in a society about values regarding the interests under attack. The ability to compromise, repugnant thought it may be to some, is also the measure of a given society's ability to adapt, whilst still upholding the principles of humanity upon which it is based. Long-term strategic planning in higher education, using simulation, can identify behavioural trends which would bring these principles under attack. Institutions of higher education are in a unique position to support research of this nature, and ensure that curricula maintain an

education that provides means to judge the value of these principles without reversion to doctrine.

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APPENDIX "A"

TWO CONTRASTING FORECASTS OF FUTURE SOCIETY:
W.W. Harman: "Nature of our Changing Society: in P.K. Piele, T.L. Eidell and S.C. Smith, Eds.; Social and Technological Change: Implications for Education. Center for Advanced Study of Educational administration, Fugene, Oregon, 1970, pp.16-20.

The "Second-Phase" Industrial Society

In the "second-phase" industrial society, cybernation will have taken over, and will do better, many of the tasks for which men's minds are presently trained. Those who are leading exciting lives at the managerial or technological forefront of the advancing society will probably work as many hours as at present. For the rest there will be increased leisure to be used for recreation or education. On the whole, there will be more years of education per person and a near-100 per cent literacy rate.

Research and services will play a more dominant role, production less. "Intellectual institutions" (universities, research laboratories, "think tanks," systems-analysis centers, etc.) will play a more significant role. Change—the research, development, and innovation process—will be institutionalized. That is, institutions will be facilitators of change rather than impediments to change. These developments will result in the growth of, and concentration of power in, a bureaucratic and knowledge-based "meritocratic" elite. A highly professional and intellectual class, this elite will comprise a network linking the widespread governmental, military, university, research, policy-analysis, urban-development, financial, commercial, and industrial organizations. Highly centralized and intensive (though possibly subtle) social control will be wielded over vocational training, worker mobility, work attitudes, and consumer habits.

New applied technology will have affected life in many ways. New types of household devices, many based on small computers and elaborate communication services, will be available, not only transforming the life of the housewife, but also allowing education and various forms of business to be carried on in the home. Through cybernation and genetic management of plants and animals, the agricultural industry will be made many times more productive in terms of use of land and labor. Coastal desert lands will be made habitable with desalinated water. Nuclear power and fuel cells will provide ample energy for all demands. Automated factories will produce practically all consumer goods, with variety programmed in to satisfy consumers. New transportation systems will have more people traveling further, faster. The housing industry will indeed have become an industry, producing new types of improved housing with mass-production economy, yet with aesthetic and functional variety.

There will be variety in cities, too, with planned communities and specialized forms—scientific cities, university cities, festival and ceremonial cities, recreational cities, and experimental cities. Experiments with alternatives to the main patterns of living (precursors being communes, bohemian urban communities, substitutes for marriage, etc.) will be commonplace. Schools in the forms we have known will virtually disappear. Instead, education will take place via combined systems of machines and human assistants located in homes, neighborhood centers, specialized learning centers, museums, and industrial and business locations.

Along with these advantages there will be some problems. Because of the lag in modernization of underdeveloped countries, the gap between rich nations and poor nations will grow even larger. International organizations of various sorts will somehow have managed to contain the nuclear threat, and will have made great strides in fostering economic development of poor nations, but international strife and a semimilitarized economy will continue. Fed by the dynamic character of science-technology and unchecked because of failure to find any satisfactory alternative to technological approaches to international problems, the arms race will have continued to escalate.

There will be internal tension too. Although some progress will have been made on the poverty problem, the white-nonwhite conflict will continue, and the alienated young of the sixties will be raising another generation, also alienated. However, the law-enforcement agencies will have regained the initiative; violence and counterviolence will be under control and conflict will mainly take the form of widespread subterranean resentments.

It will be interesting to speculate on the nature of these dissenting views. The dissenters will be, on the whole, at a higher level of material well-being than in the sixties, and better educated. We can imagine their criticism of the basic contradictions in the society as follows: The operative goals of the society are continuing expansion of output (goods and services), a commensurate increase in consumption, technological advance, efficient use of resources toward these ends, and furtherance of the public images that sustain all of these goals. Individual lives are to be spent in the service of these goals. Human wants rate lower than, and thus must conform to, the needs of the industrial system. State policies, the educational system, and conventional morality are all molded to fit the requirements of the system. Although the necessity to close the gap between rich and poor nations is recognized, it is uneconomical to trade freely with the latter or to invest heavily in their balanced economic development. The need is recognized to abolish the slums, poverty, and racism, and to provide the poor minority with adequate education and equal opportunity; yet it is uneconomical for private capital to do this and effective government action is opposed by threatened lower-middle and working-class whites. Humans need contact with nature and beauty, but it is uneconomical to design a humane urban environment or to provide money for parks, aesthetics, history, or civility. Although the channels of mass communication offer a great potential for public enlightenment, they are used mainly to promote sales and to distribute propaganda for business and government interests. Somehow the social system is not serving the interests of the individuals who comprise it; nothing short of a radical change in the operative values within it can alter this fact.

The "Person-Centered" Society

In the humanized technological society, it is precisely these operative values that have changed. The goals of the society include making economic growth meet human needs, achieving knowledge and aesthetic advance, and controlling social problems so that individuals may progress toward their own goals of self-fulfillment. The industrial system is subservient to, and responsible for fulfilling, these larger purposes of the society. The overarching goal is the cultivation and enrichment of all human beings, in all their diversity, complexity, and profundity.

According to the forecasts that describe this society, each individual will be provided with enough resources, and in such a way, as to enable him to live in dignity. Underlying the economic system will be the proposition that each free man has the right to a full life of useful, rewarding work and self-development. Economic security will not be achieved solely by welfare payments or guaranteed incomes. In part, at least, it will be accomplished by extending the principle of free goods and services from those provided today (elementary education, library services, fire and police protection, innoculations, lunch milk for children, etc.) to others (re-education for a new occupation, food and nutrition staples, urban transportation, etc.). In the "knowing society" (Drucker 1968) education will be as central to the economy as mass production has been in the past. Thus, education will be a valid occupation, entitling the student to subsistence as well as the opportunity to learn. A diversity of educational paths will be available, and men will not be judged on the basis of a single uniform academic standard. (Competitive grading, therefore, will assume much less significance.) Similarly, the society will provide a diversity of ways in which a person can win the esteem of others. In other words, economic failure or academic failure will not be equated with failure as an individual.

Mumford has analyzed the basic attitude shifts that would have to accompany conversion to the "person-centered" society. There are, he says,

> serious reasons for reconsidering the whole picture of both human and technical development on which the present organization of Western society is based. . . . The deliberate expression and fulfillment of human potentialities require a quite different approach from that bent solely on the control of natural forces. . . . Instead of liberation *from* work being the chief contribution of mechanization and automation, liberation *for* work, for educative, mind-forming work, self-rewarding even on the lowest physiological level, may become the most salutary contribution of a life-centered technology. (1963)

The society will be a planned society, but planned in such a way as to deepen, not diminish, the freedom of the individual. Opportunity will be provided for real participation in planning by those for whom the planning is done. Management structures will be such that power flows both ways.

The technological level will be high, as in the "second-phase" industrial society, but the priorities for technological development will be influenced by human and global needs. The problems of the ghetto and of the underdeveloped societies will not have been completely eliminated, but their solution will have had high priority. As a consequence of these efforts

to respond to human needs, and also as a consequence of the way people perceive the goals of society, international tensions will have lessened and internal alienation will have decreased markedly. The military establishments of the industrialized nations will have moved a long way toward cooperation in an international policing role. Internally, new standards will govern recruitment and training of officials responsible for maintaining justice and order. The image of the police will be that of protector of all, with fairness and justice to everyone regardless of skin color, economic condition, or type of haircut and beard.

Education will center on developing self-learning habits and skills, problem-solving and decision-making abilities, individuality, sound valuing capabilities, capability of continuous self-renewal, and self-understanding. Education will be much more equated with life, and, as the distinction between formal and informal education becomes increasingly blurred, will be much more a lifetime activity. The significant distinctions will not be work vs. education or work vs. leisure, but work-education-leisure vs. "killing time."

Hutchins describes "the learning society" as follows:

> ... one that, in addition to offering part-time adult education to every man and woman at every stage of grown-up life, had succeeded in transforming its values in such a way that learning, fulfillment, becoming human, had become its aims and *all its institutions were directed to this end*. This is what the Athenians did. ... They made their society one designed to bring all its members to the fullest development of their highest powers. ... In Athens, education was not a segregated activity, conducted for certain hours, in certain places, at a certain time of life. It was the aim of the society. ... The Athenian was educated by the culture, by Paideia. (1968)

The Athenian education was made possible by slavery, which was the necessary provider of leisure. But "machines can do for every modern man what slavery did for the fortunate few in Athens. The vision of a learning society ... can be realized. ... Whether it does or not depends upon the transformation of values."

But a set of values is based, in turn, on a conception of the nature of man, his potentialities, and the possibilities for their realization. That is to say, the choice between the two alternative futures we have described is also in a sense a choice between two images of man.

APPENDIX "B"

AN EXAMPLE OF AN "IDEAL" OR "MOST SUITABLE" STATE OF SOCIETY, PREDICATED ON CURRENT TRENDS AND ASSUMPTIONS

Report of Seminar on "The Stable State", Summer 1972, in Canadian Forum, Feb. 1973, p. 32.

Definition of the Stable State

The concept of the stable state involves, at its core, a notion of a world population in long-term ecological and resource equilibrium. In such a world, both ecological and resource-depletion catastrophes would be avoided so as to permit the orderly survival of the human race.

Such stability does not imply that societies would be static in their economic, social, political and cultural structures nor does it imply either that the intellectual or artistic development of individuals would be limited or that human society would be locked into a particular level or type of technology. In fact, marked changes in human values, social structures and technologies may be necessary to achieve and maintain the optimum quality of life within a stable state.

The necessity for eventually achieving a stable state derives from the simple fact that the world is finite. Our non-renewable resources are limited. The global ecosystem and the biosphere are in a dynamic equilibrium providing limited renewable resources and waste-assimilating capacity. The human economy is a subsystem of the eco-system and therefore at some level, over some period of time the sub-system must become compatible with the biosphere which supports it. Some form of stable state is therefore inevitable; whether chosen by man or imposed by nature.*

The question is one of time. How long (or have we passed it?) before we must move into a stable state? While we do not know the optimum nature or rate of transition, we stongly feel that steps must be taken which lead to a consideration of ways in which a stable state may be achieved.

Characteristics of a Stable State Society

a. It would incorporate "externalities" into our mechanisms for resource allocation. Thus, the prices paid for products and services would reflect the true costs whereas now many external costs (air, water, noise and visual pollution, destruction of aesthetically pleasing environments,) are borne by everyone but paid for by no one.

b. Product design criteria would be changed to incorporate durability, repairability and recyclability. Design would be oriented toward minimizing energy per unit of service. Careful attention should be paid to the energy components of products, not just the materials used in them. These changes will increase the lifetime of products and will reduce the consumption of resources, including energy, as well as reducing the garbage problem.

Technology will be altered. This will come about when all costs are added up (both private and social): i.e., changes will take place when the price system is made to operate in such a way that prices reflect all benefits and costs. For example, automation produces more output per worker but often destroys the satisfaction gained by the worker from the performance of a creative task, as well as subjecting him to a higher level of stress. It is usually assumed that work of any sort is work and that more output per hour must always be good, yet many people are increasingly unhappy and alienated despite higher material living standards. The price system currently does not adequately take into account the extra costs imposed upon the individual and society by many "advances" in technology, and thus over-emphasizes the immediate short-run advantages of new technology.

c. Global population will be stabilized. While we do not know the optimum level, we strongly urge that all societies decelerate population growth. This is the case since the sooner we begin to decelerate the longer we can afford to take and the less disruptive that adjustment will be. Widely agreed-upon global rules will be established and enforced to maintain a balanced eco-system. This may result in the creation of a new global institution, possibly under the auspices of the United Nations.

d. The stable state will not impede a greater degree of cultural and social diversity. Cultural and social diversity *may be* desirable as an end in itself. Ecological systems with great diversity tend to be more stable than those with only a few components. More diverse systems are able to withstand a greater stress.

e. The power of large scale interests associated with production will be decreased so that they will not interfere with the maintenance of a stable state. For example presently, through advertising, producers exert significant control over consumption. In a stable state producers will cater to real human needs and not shape and control human wants.

f. Educational systems will promote social and global cooperation, the development of satisfying personal relationships, de-emphasize material acquisition, encourage a tolerance of cultural diversity and an understanding of man's place in the biosphere. Other information systems would serve the same goals.

It is hoped that there will be a change in conception of what man should seek for fulfilment or satisfaction. It seems that our present society never really gives the individual the chance to enjoy the material wealth he has acquired because there is no level at which society tells the individual he has had enough: the system dictates that "more" is always necessary, or if not necessary, at least better.

g. There will be the adoption of a mechanism which might be called an "environmental ombudsman". At present it is impossible or prohibitively expensive for an individual or even a group of individuals to intercede on behalf of the environment. This is difficult on a national scale and impossible at the international scale. An environmental ombudsman system might be set up in such a way that action could be required *before the fact*, rather than after the fact.

Impediments in the way of Achieving a Stable State

a. No one country can move unilaterally to achieve the stable state. For example in a world characterized by a great deal of international trade a country that unilaterally fully internalized its social costs would jeopardize some of its industries. International agreement on social cost internalization is therefore necessary.

b. There is a real and continuing problem of measuring all costs so as to make the resource allocation system operate effectively. It is still not clear that measurement and charging the appropriate individual is technically feasible. More attention should be given to this problem so as to clear the technical problems.

c. The price system may not adequately reflect the long-term needs of society as compared to the shorter term interests of individuals. For example the structure of interest rates (especially in the area of resource exploitation) may discount the future excessively. Consideration should be given to the development of a social rate of interest (or system of taxation) which would place a greater emphasis on the long-term orderly development of certain irreplaceable resources. The present system, with the depletion allowance, actually acts in such a way as to relatively promote investment in resource exploitation to a greater degree than in other areas like manufacturing.

d. Many decisions are based on political expediency and are oriented toward the very short-term. Thus often the price system is not allowed to function properly and is short-circuited by the political process.

e. The ethic of growth has been a part of the industrialization process for over 150 years. There is an implicit and sometimes explicit view that growth alone can solve many of society's problems. Thus there is a resistance to moving away from a growth system which is believed to bring benefits to all. Those who benefit or *feel* that they benefit from the current growth system could be powerful agents against change.

f. There is the seductive argument that we need more technology to offset the ill effects of past technology. This is the reliance on the "technological fix". It would be a serious mistake to say that since technology has "saved us" in the past it will continue to do so in the future.